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# Social presence, Web videoconferencing and learning in virtual teams

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**Abstract:** *The potential of information technology to facilitate collaboration in education has grown considerably in recent years. The use of Web videoconferencing, whereby learners in an online classroom can simultaneously collaborate using audiovisual communication tools, increases the learner's ability in social and emotional expression, thus improving communication which may enhance learning satisfaction. This paper compares two cohorts of students who attended the same online course in economics. Both could communicate via a discussion board and one cohort had the additional opportunity to participate in Web conferences. Contrary to expectations, learning satisfaction did not seem to increase with the introduction of Web videoconferencing. This finding leads to several questions for future research.*

**Keywords:** *Web videoconferencing; collaborative education; online education; learning satisfaction*

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A large body of literature in computer-supported collaborative learning (CSCL) has highlighted the fact that synchronous communication is superior to asynchronous communication in establishing discourse. It does this by overcoming the lack of bodily communication, delayed feedback and barriers of meaning in asynchronous tools such as discussion forums (Beers *et al.*, 2007; Derks *et al.*, 2007; Haythornthwaite, 2000; Mehrabi *et al.*, 2000; Rummel and Spada, 2005; Tu, 2002). Tu (2002), for example, found that discussion forums had the lowest level of conveying feelings and emotion. Haythornthwaite (2000) noted that people with frequent and strong ties to others used more synchronous communication tools, or asynchronous tools as if they were synchronous.

Beers *et al.* (2007) argued that, for online teams to share and construct knowledge effectively, they had to

be able to understand one another, which is more difficult in asynchronous communication. Often, a lack of shared context, body language or writing style leads to an interpretation of written text (such as a post on a discussion board) not intended by the writer (Bromme *et al.*, 2005). Due to miscommunication, a learner's connectivity and sense of belonging (relatedness) may be reduced, as may perceived competences and this in turn can reduce social interaction.

A recent development in collaborative working and learning has been the use of synchronous tools such as Web videoconferences, whereby learners meet online at a fixed time (synchronous) in an online classroom. While Web videoconferencing is not a new phenomenon, tools like Skype, MSN Web Messenger and Acrobat Connect allow learners to communicate efficiently using free or low-cost technology, such as a

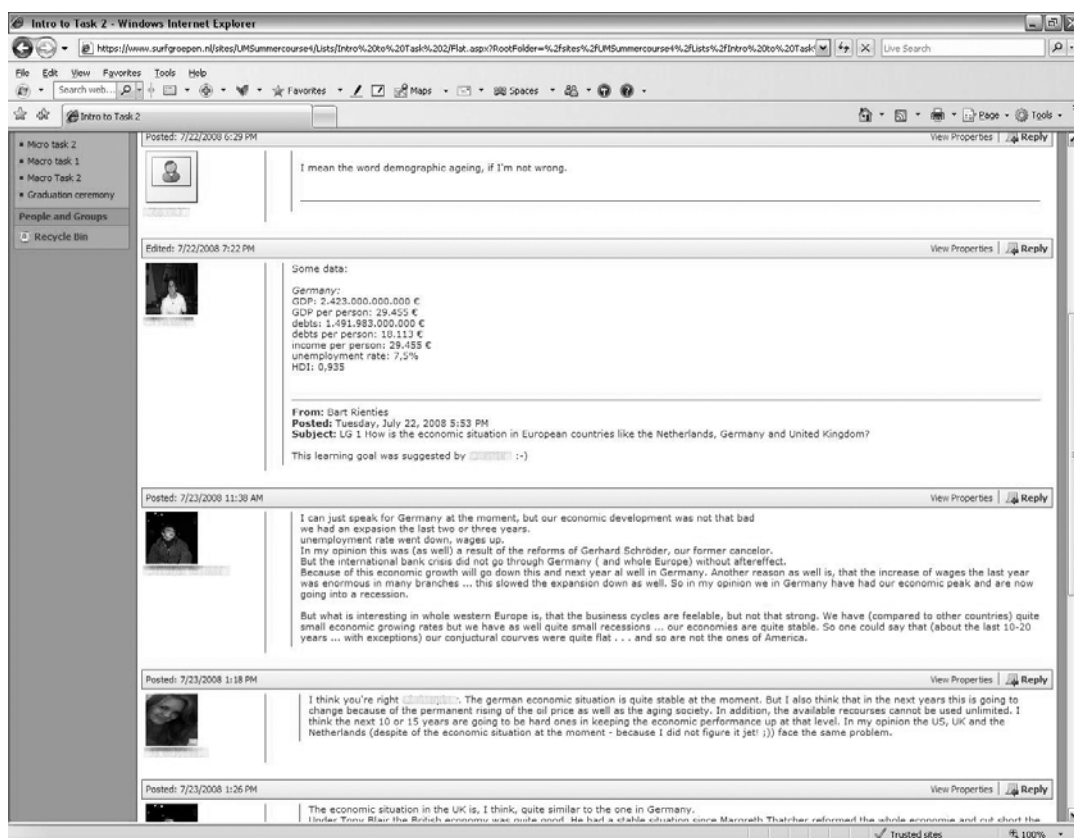


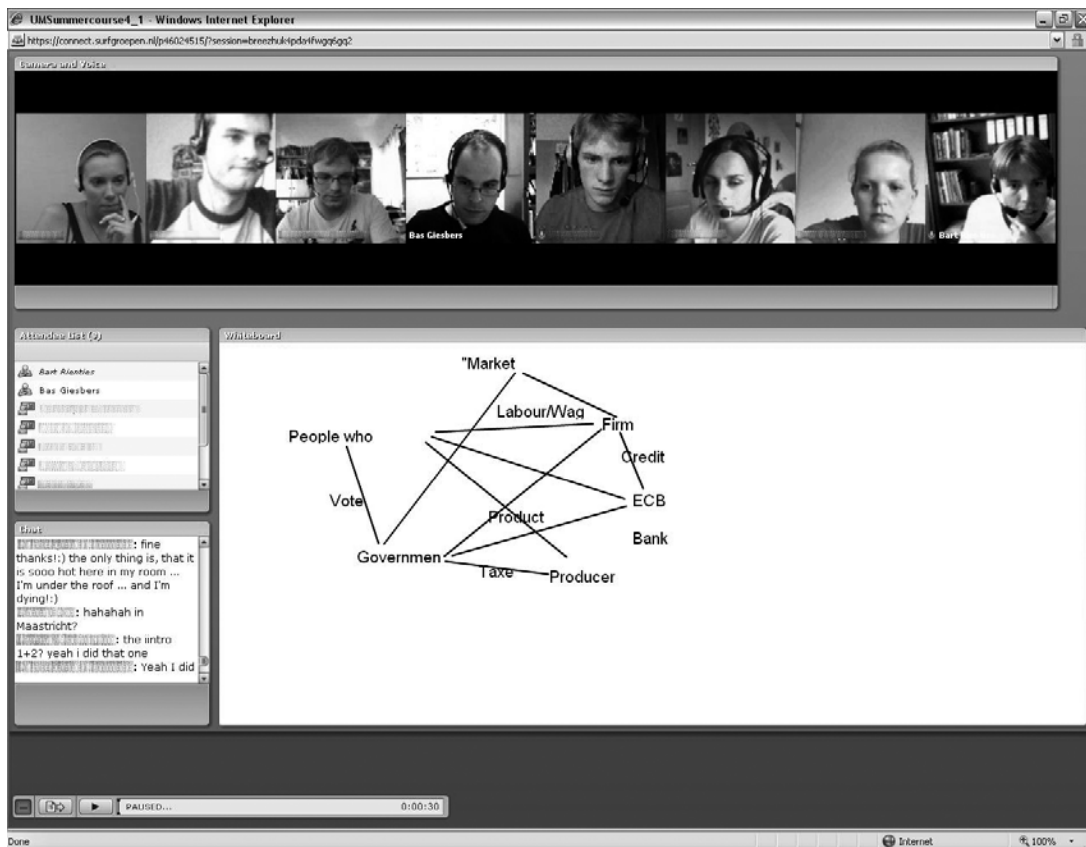
Figure 1. An example of asynchronous communication using a discussion board.

simple desktop computer. Until recently, such basic technology would allow only for asynchronous communication, as in discussion groups. The differences in these two formats of communication are substantial, from both the functional and motivational perspectives, as the look-and-feel differences visible in Figures 1 and 2 demonstrate. Figure 1 shows a discussion board supporting asynchronous communication and Figure 2 shows a Web videoconference tool that allows for synchronous communication. (Both examples are from a collaborative environment called Surfgroepen ([www.surfgroepen.nl](http://www.surfgroepen.nl)) offered by SURFnet, which allows Dutch universities and research institutes to collaborate nationally and internationally by using innovative Internet communication facilities.) As Figure 2 shows, Web videoconferencing enriches the learning environment by including audiovisual information such as face expressions, the collaborative use of a whiteboard and chat.

Garrison *et al* (2000) present a model in which the interaction of social presence, teaching presence and cognitive presence is crucial for meaningful learning to occur. The use of Web videoconferencing is likely to have a positive effect on social presence since it is defined as 'the ability of participants [. . .] to project

their personal characteristics into the community, thereby presenting themselves to the other participants as "real people"' (Garrison *et al*, 2000, p 89). Social presence has been found to determine learners' experience and perception of social interaction (Yang *et al*, 2006). If learners are able to be seen and heard simultaneously and use a shared workspace through Web videoconferencing while being physically separated, social presence is increased since the participants are more able to express themselves socially and emotionally in a group. Of course, cognitive presence (meaning construction through communication) and teaching presence (the facilitation of social and cognitive presence) are also affected by using Web videoconferencing, but not as directly as social presence.

Several researchers have argued that clear design in an online course and adequate instruction are essential prerequisites for effective collaborative learning in virtual teams (Anderson *et al*, 2001; Arts *et al*, 2006; Beers *et al*, 2005; Kirschner *et al*, 2004). This can be established through the support of teaching presence which, in online settings, can also be achieved by Web videoconferences. Because the facilitator is present during synchronous communication and both course



**Figure 2.** An example of synchronous communication using Web videoconferencing.

design and course material can be presented in a more direct way, teaching presence is enlarged.

Furthermore, recent research (Caspi and Blau, 2008; Rogers and Lea, 2005) has suggested that an increase in social presence is important, not only because of its impact on the quality of collaboration. The development of a shared group identity is considered a more important factor and, when achieved, may help even the leanest form of communication to become a successful tool of collaborative learning. Moreover, Rogers and Lea (2005) have argued that the visual cues of some may even distract the attention of others.

To investigate the potential of Web videoconferencing, we compared two cohorts of students participating in the same course. One cohort could communicate only asynchronously by using a discussion board, while the other was facilitated with regular Web videoconferences in addition to the discussion board. The use of Web videoconferences led to a direct increase of social presence in the second group and provided an additional functionality by which a shared group identity could be formed or restricted.

Based on the increase in social presence and the availability of a richer set of learning tools (such as

a collaborative whiteboard) when using Web videoconferences, we expected a positive impact on course design and the achievement of learning goals and tasks. In addition, as it should be easier to establish communication and express emotion with Web videoconferencing than with discussion forums (Derks *et al.*, 2007; Jonassen and Kwon, 2001; Rourke *et al.*, 2001; Tu and McIsaac, 2002), we expected improved collaboration. As it is also easier for the teacher to provide timely feedback and instruction in synchronous communication (De Laat *et al.*, 2007; Vonderwell, 2003), we expected students' rating of teacher instruction in the second cohort to be higher. Finally, we expected the hypothesized increase in social presence and teaching presence to have a positive impact on cognitive presence, which in turn was expected to increase learners' satisfaction. As the course material and assessments were the same in both phases, we expected no change in perceived usefulness.

Given the increased use of Web-based synchronous communication tools in professional business environments (online meetings, corporate training etc), the findings of this study are relevant for many fields outside business education.

## Method

### Setting

The present study took place during an online summer course for students intending to study for a Bachelor's degree in International Business in the Netherlands. The aim of the summer course was to bridge the gap in the students' prior knowledge of economics before they began their degree studies (Rienties *et al.*, 2006). The online course was delivered over six weeks, during which students were expected to work for 10–15 hours per week. The participants never met face-to-face before or during the course and had to learn to use the virtual learning environment 'on the fly'. The course applied the principles of problem-based learning (PBL), which focuses student learning on complex situations and a variety of realistic information (Dochy *et al.*, 2003; Van den Bossche *et al.*, 2006). A key issue in PBL is that students actively construct knowledge in collaborative groups (Hmelo-Silver, 2004). To assess the influence of Web videoconferencing on social presence and learning in virtual teams, two experimental conditions were applied in separate cohorts.

To investigate whether increasing social presence by adding Web videoconferencing led to an increase in students' perceived usefulness of the course, we compared two cohorts of students. Both participated in the same course, with cohort 1 applying an asynchronous environment offering communication via a discussion board, and cohort 2 having the additional functionality of Web videoconferencing. As participation in the online bridging course is optional, as is participation in an entry test that provides students with feedback on their prior level of mastery, selection effects might be present. Individual differences in learning motivation, ranging from being intrinsically motivated to being extrinsically motivated to not being motivated to learn, were expected to be a potential source of selection bias (Rienties *et al.*, in press). Measurements of learning motivation were therefore included, so that checks could be made that the cohorts were comparable with regard to the relevant individual characteristics.

In both cohorts, students had to collaborate to solve six tasks. An e-book was available and they could use additional resources. The tutorial group, together with their tutor, could decide on the pace within a maximum runtime of six weeks. At the end of each week, the tutor suggested how to proceed with the next task, thus focusing on process rather than on content. The results of three intermediate tests and a final summative test combined with graded participation in the discussion forums were used to make a pass–fail decision. A non-recognized certificate

and a drink at a graduation ceremony were the only external rewards.

In cohort 1, students had access to a collaborative learning environment equipped with discussion forums and announcement boards. No obligatory meetings were scheduled. In cohort 2, students could also attend four Web videoconferences. A novelty of the Web videoconference system was the simultaneous use of video/audio communication, chat and an integrated whiteboard. At the start of the course, the students spent a lot of time on becoming acquainted with each other during the first videoconference. In addition, the course design, goals and the first task were discussed within the group so that the students would be familiarized with PBL. Afterwards, the students discussed the tasks in the discussion forums. At the start of each new week, a videoconference was organized to discuss assignments, after which the students continued working in the discussion forum.

### Participants

In cohort 1, 100 participants were randomly assigned to six groups. Data were analysed for those participants who actually posted at least once in the discussion forum. This resulted in a total of 82 participants selected for analysis. The six groups had an average of 13.66 members ( $SD=2.16$ , range=11–17) per group. The average age was 19 and 50% of the learners were female.

In cohort 2, 69 participants were randomly assigned to five groups, of which 62 actually posted at least once in the discussion forum or attended a Web videoconference. The five groups had an average of 13.80 members ( $SD=2.59$ , range=11–18) per group. The average age was 19 and 39% of the learners were female. As the numbers of participants in the two phases was unequal, we removed one rather atypical group from cohort 1: it differed from the other groups in its type of learning motivation and underperformed in discourse. This left 71 participants in cohort 1 and 62 in cohort 2.

### Instruments

*Expectations before the start of the course.* Before the course started, participants' perceptions of the online course were measured by an instrument developed at Maastricht University. The questionnaire comprised 18 questions on a seven-point Likert scale, ranging from 1 (totally disagree) to 7 (totally agree). The questionnaire was divided into four categories: (a) the usefulness of the prior knowledge test (four items); (b) reasons for joining the course (five items); (c) group collaboration (four items); and (d) the appropriateness of the course design (five items). Aside from these categories,



participants could indicate their level of ICT expertise, whether 'beginning' (26.3%), 'experienced' (62.6%) or 'expert' (11.1%). Fewer than 10% of the students had taken an online course before. The response rates for cohort 1 and cohort 2 were 93% and 73%, respectively.

*Academic motivation.* Previous research on virtual teams has shown that type of academic motivation can have a strong influence on learning processes and outcomes (Rienties *et al*, in press). Individual contextual motivation for education was measured by the Academic Motivation Scale (AMS) (Vallerand *et al*, 1992), which consists of 28 items based on the question stem 'Why are you going to college?' There are seven sub-scales in the AMS, of which three belong to the intrinsic motivation scale, three to the extrinsic motivation scale and one to no motivation. 'Intrinsic' motivation includes motivation to know, to accomplish and to experience stimulation. The 'extrinsic' motivation sub-scales constitute a motivational continuum reflecting the degree of self-determined behaviour, ranging from identified regulation as the component most adjacent to intrinsic motivation, to externally regulated learning, where learning is steered through external means such as rewards. The 'no motivation' scale constitutes the extreme of the continuum: the absence of regulation, either externally or internally directed. The AMS questionnaire was completed before the course started. The response rates for cohorts 1 and 2 were 93% and 73%, respectively, and the Cronbach alpha of the seven sub-scales ranged from 0.760 to 0.856, which is in line with previous studies.

*Perceived usefulness of the course.* The perceived usefulness of the course was measured by an instrument developed specifically for online remedial education (Rienties *et al*, 2006). This measure has been used in a variety of online courses for prospective Bachelor's and Master's students in The Netherlands as well as for international professionals working together in virtual teams (Rehm, 2009). The questionnaire consists of 33 questions on a five-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree), and spans seven categories: assessment (four items); course design (six items); course materials (three items); goals and tasks (four items); group collaboration (five items); instruction by teacher (five items); and learning satisfaction (five items). For cohort 2, a further category was added to measure the perceived usefulness of videoconferencing relative to the discussion forum (five items). Finally, the participants' age and the number of hours worked were measured and a textbox for open comments was included. Contrary to the above

instruments, this questionnaire was completed at the end of the course. The response rates for cohorts 1 and 2 were 83% and 77%, respectively.

### Analysis

The metric used to estimate and describe perceived usefulness of the two online course designs was the standardized difference of two means (Cohen's *d* effect size). This metric is appropriate when the means of two groups are compared. Cohen's *d* expresses the distance between two group means in terms of their pooled standard deviation (Cohen, 1998). Cohen recommended that  $d=0.20$  (small effect),  $d=0.50$  (moderate effect) and  $d=0.80$  (large effect) should serve as a general guideline across disciplines.

## Results

The cohorts showed no significant differences with respect to age, gender, ICT skills and prior experiences with online education. With respect to students' expectations before the start of the course, no significant differences were found in the four categories using an independent sample *t*-test, with the outcome for group collaboration being somewhat indecisive. Before the start of the online course, cohort 1 users were on average more positive about the usefulness of group collaboration than cohort 2 users ( $F=14.978$ ,  $t=1.972$ ,  $p=0.051$ ,  $d=0.36$ ). Although the difference is almost statistically significant, the effect size (Cohen's *d* value) is small. No significant differences were found among participants with respect to intrinsic motivation. However, participants in cohort 1 had a higher level of identified regulation ( $F=0.728$ ,  $t=2.157$ ,  $p=0.033$ ,  $d=0.42$ ) and external regulation ( $F=5.633$ ,  $t=2.409$ ,  $p=0.018$ ,  $d=0.45$ ), indicating that cohort 1 participants were slightly more extrinsically motivated. Nonetheless, the size effects were small and Rienties *et al* (in press) showed that extrinsically motivated students did not differ significantly from average students in virtual teams with respect to their contribution to discourse.

### Effects of the redesign

Table 1 displays the scores for each of the 37 questions referring to the perceived usefulness of the course. Cohort 1 students were in general very pleased with the online course. Most scores for the five-point Likert scale questions average around 4.0, while the overall course score and the score for teacher support surpasses eight on a ten-point scale. Quite surprisingly, cohort 2 students seemed to be less positive. Eight questions have statistically significant lower scores in cohort 2 than in cohort 1 on the basis of an independent sample

Table 1. Comparison of course usefulness per item.

		Discussion forum		Videoconference		t-test difference
		M	SD	M	SD	
AS	The instructions for taking the final test were clear	4.05	0.75	3.79	0.71	0.073***
AS	The weekly tests (intermediate tests) in this course gave me a good picture of what I still had to study	3.78	0.79	3.96	0.62	–
AS	The Internet application used for the tests was easy to work with	4.15	0.83	3.88	0.94	–
AS	I have taken . . . weekly (intermediate) tests	2.81	0.97	2.60	1.35	–
CD	The contents of the course were inspiring	4.15	0.61	3.94	0.56	0.063***
CD	The format of the course was good	4.15	0.69	4.04	0.77	–
CD	The course was well organized	4.10	0.64	4.17	0.72	–
CD	I think I was motivated to finish this course because I could work at my own pace	3.68	0.94	3.83	0.86	–
CD	It is good that I could attend this course independently (without interference from others)	4.37	0.61	3.92	0.87	0.02*
CD/2	Give an overall grade for the quality of the course (1=very bad; 10=very good)	8.46	1.02	7.73	1.33	0.01**
CM	The quality of the digital material was good	4.44	0.60	3.96	0.85	0.01**
CM	The digital material motivated me to keep up with the subject matter	3.63	0.81	3.54	0.90	–
CM	Learning with an e-book is not different from learning with a hard-copy book	2.78	0.89	2.85	0.99	–
GC	The group in which I participated functioned well	3.86	0.86	3.56	0.90	0.079***
GC	It was fun to collaborate with others on this course	4.07	0.85	3.71	0.94	0.041*
GC	Collaborating with others facilitated my understanding of the subject matter	3.78	0.72	3.65	0.79	–
GC	I think I learned more on this course through collaboration with others than if I had worked independently	3.19	1.15	3.25	1.10	–
GC	I participated actively in the online group discussions	3.19	1.15	3.25	1.10	–
GT	The goals of the course were clear to me	4.00	0.72	4.17	0.63	–
GT	It was clear to me what was expected of me on this course	3.85	0.87	4.04	0.71	–
GT	The assignments/tasks stimulated me to collaborate with the other group	3.53	0.86	3.50	0.92	–
GT	The assignments/tasks stimulated me to study	3.78	0.85	3.69	0.80	–
IN	I was given the support I needed	4.03	0.69	4.23	0.66	–
IN	The online course team was enthusiastic in coaching our group	4.22	0.72	4.54	0.58	–
IN	The online course team stimulated the participation of all group members in the online group discussions	3.54	0.86	3.88	0.70	–
IN	The online course helped us to apply what we had learned in other situations than those mentioned in the assignment tasks	3.63	0.61	3.94	0.91	–
IN/2	Give an overall grade for the functioning of the course team (1=very bad; 10=very good)	8.20	0.94	7.99	1.42	–
LS	This course offered me a lot	4.27	0.64	4.02	0.53	–
LS	It was fun to attend this course via the Internet	4.22	0.74	4.06	0.81	–
LS	I am satisfied with what I learned in terms of knowledge, skills and insight	3.81	0.78	3.69	0.88	–
LS	I gained enough knowledge and skills in economics to start my studies in Maastricht	3.68	0.71	3.73	0.79	–
LS	I think that, by attending this course, I shall get better results in my future studies in Maastricht	3.85	0.71	3.77	0.93	–
VC	The use of the Web videoconference (Breeze) was helpful	–	–	3.79	0.87	–
VC	I learned a lot from the discussions in the Web videoconferences (Breeze)	–	–	3.48	0.92	–
VC	The use of the discussion forums (SURF-groepen) was helpful	–	–	3.90	0.93	–
VC	I learned a lot from the discussions in the discussion forums	–	–	3.27	1.01	–
VC	There were too many Web videoconferences on the course	–	–	2.67	0.86	–
	I have spent . . . hours on this course per week	13.43	6.76	11.12	5.54	0.069***

Notes: Independent sample t-test (two-sided) of the discussion forum (n=59) versus videoconference and discussion forum (n=49).

\* Coefficient is significant at the 0.05 level (two-tailed); \*\* Significant at the 0.01 level (two-tailed); \*\*\* Significant at the 0.10 level (two-tailed).

AS=assessment; CD=course design; CM=course material; GC=group collaboration; GT=goals and tasks; IN=instruction; LS=learning satisfaction; VC=videoconference.

**Table 2. Perceived course usefulness by category.**

	Discussion forum		Videoconference		t-test difference	Cohen d value
	M	SD	M	SD		
Assessment	14.80	2.41	14.23	2.60	–	–
Course materials	11.29	1.66	10.65	1.80	0.058**	0.37
Course design	24.69	2.59	23.76	2.48	0.064**	0.36
Group collaboration	18.24	3.34	17.42	3.28	–	–
Goals and tasks	15.15	2.51	15.40	1.82	–	–
Instruction	19.53	2.13	20.57	2.09	0.012*	–0.50
Learning satisfaction	19.83	2.50	19.27	2.73	–	–

Notes: Independent sample t-test (two-sided) of discussion forum (n=59) versus videoconferencing and discussion forum (n=49).

\* Coefficient is significant at the 0.05 level (two-tailed); \*\* Significant at the 0.10 level (two-tailed).

t-test. In particular, the overall grade for the online course for cohort 2 is 0.7 points lower, which is statistically significant at 1%. In contrast, cohort 2 shows significantly higher scores for the three questions concerning the role of the instructor.

With respect to the redesign, five questions were put to students of cohort 2 in order to measure the usefulness of Web videoconferencing and discussion forums. Students in cohort 2 were positive about both the use of the Web videoconference system (average score=3.8) and the use of discussion forums (average score=3.9). However, the slightly higher value in cohort 2 for learning in videoconference sessions (average score=3.5) than for the discussion forums (average score=3.3) is insignificant in a paired sample t-test. Finally, students in cohort 2 worked fewer hours per week than students in cohort 1, which is significant at a 10% significance level.

Table 2 lists the effects of the redesign on the perceived usefulness of the course per category. In contrast to our expectations, students in cohort 2 were less satisfied with the course materials. With respect to the course design, cohort 2 students differ from cohort 1 students, but the effect is in the opposite direction to what we expected. In other words, cohort 1 students were more satisfied with the course design than cohort 2 students. No effect was found with respect to goals and tasks and group collaboration. We found an improved satisfaction of the role of the teacher in cohort 2 at a 5% significance level with a moderate size effect ( $F=0.057$ ,  $t=2.549$ ,  $p=0.012$ ,  $d=0.50$ ). However, we did not find any difference among the cohorts with respect to learning satisfaction. Overall, we have to conclude that students who used Web videoconferencing in addition to discussion forums were not more positive about the online course than students who used only the discussion forums.

## Discussion

Based on the idea that better opportunities to establish communication and express emotion contribute to social presence, we expected that the use of Web videoconferences would positively influence perceptions of the course design, goals and tasks, group collaboration, instruction and finally learning satisfaction among learners. In other words, we expected that groups working together using synchronous Web videoconferences in combination with asynchronous discussion forums would be more positive about the course's usefulness than groups who worked together using only discussion forums. However, the results indicate that students using videoconferencing were in general not more positive about the online course, with the exception of their perception of teacher instruction.

The fact that students in cohort 2 (Web videoconferencing) were less positive about the course materials may be explained by other factors. In cohort 2 a new version of the e-book system was used, which seemed to be less compatible with Apple machines. In fact, six students complained about compatibility (for example, 'exercises cannot be made with a Mac'; 'that it works better with Mac computers') in response to the 'open' question, while there were no remarks about compatibility in cohort 1, which might explain the lower rating for course materials. Secondly, as the course materials were the same in both cohorts, the lower score from cohort 2 students may be directly attributable to the use of the richer learning environment. As Rogers and Lea (2005) suggest, richer learning environments can lead to distraction from learning rather than being a constructive addition.

The lower evaluation of the course design for cohort 2 raises several questions. Although discussion forums



have obvious disadvantages with respect to the speed of interaction, feedback and the ability to express emotion, they have the important advantage that students can learn whenever they want. Flexibility may be important for online remedial education when prospective students are preparing themselves for university at home or at their holiday location (Rienties *et al*, 2006). In addition, several authors have argued that, by using discussion forums, participants have more time to think and are therefore more able to build effective arguments (Schellens and Valcke, 2006; Weinberger and Fischer, 2006). Even though the second cohort also used discussion boards, the use of Web videoconferences may have put additional pressure on participants leading to a decrease in perceived usefulness.

Explaining the fact that no difference was found in the perception of goals and tasks, group collaboration and learning satisfaction between the two cohorts is challenging. It may be that the goals and tasks of the course were sufficiently clear when communicated via a course manual and communication by the instructors in the discussion forum, as cohort 1 students indicated that they knew what was expected of them. This would indicate that Web videoconferencing was perceived as an unnecessary extra, which, as Rogers and Lea (2005) have suggested, could be a distraction. Given that it is easier to establish communication and social presence using Web videoconferencing, we at least expected that cohort 2 students would be more positive about the merits of group collaboration. Again, the merits of synchronous communication might be offset by the flexibility of asynchronous communication or might act as a distraction. In addition, not all participants had an adequate broadband connection, which may have hampered their ability to contribute to the videoconference discussions and hence their perception about group collaboration.

As group collaboration and the course design were not improved in the redesign, the overall learning satisfaction did not increase despite the fact that the role of the instructor was perceived more positively. A possible explanation as to why the role of the instructor (for example, in helping students to apply the content to other contexts or stimulating the participation of more passive students) received a higher rating is that the delay in feedback in asynchronous communication could have been counteracted by the weekly videoconferences. Beyond that, a rough comparison of the roles of the instructor in the videoconference and in the discussion forum indicates that the instructor was more active in the videoconference, which in distance learning is highly appreciated by students (Vonderwell, 2003).

### Limitations and future research

The results of this study are based on self-reported student perceptions in one particular setting. This can be viewed as a potential limitation, as in other settings Web conferencing may lead to superior results to the use of discussion forums only. In addition, the measurement of participants' perceptions of learning characteristics and learning processes is difficult. However, given the reliability figures of the seven categories, high response rates and the fact that we controlled for differences in motivation and prior expectations, we deem that the results remain valid.

Second, the formation and perception of group identity were not measured in this study. As the perceived usefulness of group collaboration at the start of the online courses was different in the two cohorts, this may have affected the formation and perception of group identity. If we want to assess whether this factor is improving performance, it should be measured. Content analysis of the posts in the discussion boards may provide further indications in this respect.

Third, neither content analysis nor social network analysis was conducted on the discourse. These analyses may reveal evidence about learning and knowledge construction from online discussions and interaction patterns among individuals within groups. Research for cohort 1 showed large differences in participation, type of discourse and position within the social network (Rienties *et al*, in press), which we would expect to be smaller in cohort 2 given to the increased opportunities for interaction.

Fourth, future research should investigate whether groups using Web videoconferences are more balanced with respect to type of discourse and participation. In addition, to what extent are students overwhelmed by a variety of ICT tools? To what extent does the requirement to be present during videoconferences hinder the flexibility of learners to decide when and where to learn? Finally, how much does the behaviour of participants (students and teachers) differ when using Web videoconferences and discussion forums?

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